INSTRUCTION PAMPHLET U-5002

April, 1927

MAINTENANCE

OF

STYLE "T-2" A. C. SIGNAL

UNION SWITCH & SIGNAL CO.

SWISSVALE, PA.

UNION SWITCH & SIGNAL COMPANY

Swissvale, Pa.

MAINTENANCE OF STYLE "T-2" A. C. SIGNALS

1. General

The points of major importance in the maintenance of the Style "T-2" a-c, signal mechanism are covered in a notice mounted inside the mechanism case door. Reference should be made to these instructions with sufficient frequency to insure adherence thereto.

Care should be exercised to protect all parts of the mechanism against exposure and also to prevent foreign substances getting into parts where they might cause trouble.

2. Lubrication

Avoid using too much oil.

Union Non-freezing Lubricating Oil (Specification 1093) or some other high grade light oil, free from acid, should be used.

(a) *Motor ball bearings* should be oiled every two weeks, using not to exceed ten drops for each oil cup.

(b) *Gear bearings* should be oiled once in three months.

(c) *Semaphore shaft bearings* should be lubricated every six months by applying Dixon's Semaphore Lubricant or 2 V H Tulc by means of a grease gun. The graphite should be kept soft by adding a few drops of Oil to the bearings three months after the grease is applied.

(d) *Recess between motor rotor and shaft* where oil cup is not provided, should be filled with Dixon's Semaphore Lubricant or Tulc once a

year. Where oil cup is provided, a few drops of oil should be applied every two weeks, no other lubricant being used.

(e) *Cone clutch* between motor rotor shaft and pinion gear must be kept absolutely free from oil. Only Dixon's 095 Graphite should be used when refilling of recesses in this clutch is necessary. Graphite should be applied to this clutch once a year. While this is being done, a small piece of cloth or waste should be wrapped around the motor shaft between the cone and the motor case to prevent particles of graphite entering the motor ball bearing.

3. Motor and Slot

The motor and slot are housed in the same case. The rotating elements have no windings, brushes or contacts. The slot rotor is pinned to the shaft while the motor rotor engages the shaft through ratchet and pawls which allow the motor rotor to spin freely when the blade has returned to the "stop" or horizontal position. The cone clutch on the motor rotor shaft functions to reduce the strain on the gears when the motor over-travels and the segmental gear movement is arrested by the stop at the back of the gear case. This cone clutch, interposed between the motor and the gear train, should be adjusted to begin to slip when the motor shaft is held rigid and a force of not less than one, nor more than two pounds, is applied to the pinion at a radius of one foot. This adjustment is secured by drawing out the spring holding the clutch in engagement. The slip of the cone clutch can be noted by marking the position of one of the teeth of the ratchet at the front of the motor shaft when the signal is at "stop", and allowing the signal to clear, and then return to its original position; the change in the position of the ratchet tooth occurring during this operation will indicate the amount of slip of the clutch. If the voltage is above normal the clutch may slip

due to over-travel when the signal clears, this tending to offset the slip when it assumes the "stop" position. Should no slip be observed the clutch should be taken apart, lubricated as instructed above, and readjusted to hold between one and two foot-pounds. The clutch must be kept free from oil, to avoid slipping during the clearing stroke.

To take the motor apart, unbolt it from the gear case, compress the clutch spring so that its slotted washer can be removed, and then slip off the pinion which will allow the rotating member to be taken out of the motor case after removing the head. The motor rotor may be removed by slipping off the slotted washer which retains the spring and ratchet at the front end of the motor shaft. Care should be taken to keep the interior of the motor free from cinders or other foreign matter which might obstruct the air gap.

The motor shaft should have not less than .015 in. ($\frac{1}{64}$ in.) nor more than .047 in. ($\frac{3}{64}$ in.) end play. This end play may be easily observed in signals where skeleton front end covers are used by opening the cover and taking out the motor rotor. The cover should then be replaced and the end play of the shaft measured by moving it forward and backward. If such movement results in a chattering or loud humming noise while the motor is energized, it should be replaced as this is an indication of worn or loose parts, or else too great end play. End play may be reduced by adding a $\frac{1}{32}$ in. washer at the front end of the motor shaft adjacent to the ball bearing in the removable motor head. This washer should be held in place by prick punching the shaft in one place, using a center punch which has been half ground away, with the flat ground surface against the shaft when it is punched.

The air gap between the motor rotor and the stator should be uniform and not less than .028 in. at any point. This can be easily checked by opening the front end cover and using a leaf gauge.

4. Circuit Controller

The circuit controller moves through an arc three times that covered by the movement of the semaphore shaft and in the opposite direction. The circuit controller drum which carries segments is driven from a shaft intermediate between the motor and semaphore shafts, through a spline joint, the latter allowing the controller drum to be easily removed after two fillister head screws have been taken from the front plate of the controller. Any contact segment may be shifted in line with its travel by loosening the castellated nut at the front end of the controller shaft and pulling the segment away from its insulating bushing. One notch in the bushing corresponds to four degrees change in segment location, or 1 1/3 degrees in movement of signal blade.

Before shipment from the factory, signals are tested and adjusted for operation with a spectacle having a maximum torque of 46 to 48 foot-pounds. Any considerable deviation from these torque values should be compensated by adjustment of the 45° and 90° motor control segments of the main controller, and the contact segment of the auxiliary controller. Similar adjustment should be made to compensate for voltage ranges differing from that stated on the paster in the signal case cover. *The adjustment of the 45° SLOT CONTROL segment should not be changed.*

The circuit controller is ordinarily provided with blank segments which may be cut, after marking before removal of the controller, to correspond with positions of the signal blade so as to provide any desired circuit control. Whenever the controller is taken apart, index marks should be made on segments and adjacent bushings so as to insure that these will be replaced in their proper positions.

Contact springs should bear on their segments with not more than one pound pressure. Stop springs are provided to prevent the contact springs being

deflected too far inward; it must be noted that these are functioning properly. All ordinary adjustments can be made by loosening the fillister head screw supporting the contact and retaining springs. For extraordinary adjustment, the contact spring should be removed from its slot and given a set toward the segment at a point $1\frac{1}{4}$ in. from the slotted end. It can then be reassembled on the controller terminal board and its tension relieved by pulling it away from the segment until a pressure of not more than one pound is registered.

An auxiliary circuit controller provided on the three position mechanism closes a buffing circuit on the motor to retard its movement from the "proceed" to the "caution" position. Under normal conditions this prevents the blade traveling below the lowest "caution" holding position and from operating the pole changer.

Circuit controllers should be inspected at least once a month to insure the proper action of their parts.

5. Gear Case and Gears

The gear case is dustproof and need not be opened except in an emergency. If, for any reason the gears are disassembled, care must be taken to see that they are properly remeshed.

Before leaving the factory, the gear teeth are given a coat of vaseline to prevent corrosion. If the signal has been stored for a long time before installation, the gears may have become rusty or gummed, which will be indicated by a squeaking or grinding noise when the signal is operated. If this is the case, the gears should be cleaned with oil which may be applied through the motor pinion hole in the gear case after removing the motor. This oil should be drawn off by removing the plug in the bottom of the gear case.

Supplementary instructions and wiring diagram are to be found in the signal case and should be referred to when inspecting or repairing the mechanism.

6. Friction Torque

Torque tests are recommended as being the most direct way of determining whether the entire mechanism is working freely and safely. A spring scale indicating up to 25 pounds may be applied to the semaphore by using some form of clamp which will allow the lever arm from the semaphore shaft to the point of scale attachment to be two feet long and the pull on the scale to be at right angles to the lever arm at either of the two blade positions, 45° and 90°. The scale reading in pounds multiplied by two is the torque measurement in foot pounds, since the lever arm is two feet long. The signal mechanism complete should exert a pull of at least 12 pounds at two feet radius (24 foot-pounds torque) when in the 90° position and of at least 18 pounds at two feet (36 foot-pounds torque) when in the 45° position.

Friction torque tests should be made once each year.

7. Inspection

In placing the signal in service and in periodic inspections, the following points should be borne in mind:

(a) *Lubrication.* The signal should be properly lubricated. Note that ball bearings require but very little oil.

(b) *Excessive Friction.* If the signal does not return promptly to the "stop" position when the motor and slot are deenergized, excessive friction is indicated, the cause of which should be immediately located and remedied.

The motor may not work freely due to damage in shipment, wear, or the presence of foreign matter in its bearings. The end play, uniformity of air gap between stator and rotor, and the condition of the ball bearings should be noted.

If a signal works sluggishly after motor is removed, the bearings should be gone over to determine whether any foreign substance is preventing their free movement. Circuit controllers should be inspected carefully to determine whether excessive tension of springs is adding too great a load.

(c) *Clearances.* An indication of parts wearing or excessive end play is a chattering or loud humming noise when the motor is energized, i.e., when the signal indicates "Caution" or "Proceed."